



Messages in the Dust: Lessons Learned, Post-9/11, for Environmental Health

Francesca Lyman

Editor's note: Astounded at what had happened in New York and Washington on September 11, 2001, the Chartered Institute of Environmental Health (CIEH), NEHA's counterpart in the United Kingdom, acted swiftly. CIEH donated a sum of money to NEHA to assist environmental health in the United States.

NEHA's first idea was to forward the funds to public health agencies affected by the events in the Washington, Northern Virginia, and New York City areas. These agencies, however, indicated that they did not need the financial assistance.

The NEHA Board of Directors then decided that the money might best be used to commission a "Lessons Learned" study for the profession. A professional journalist would be hired to carefully examine the response of environmental health professionals to the events of September 11. From that response, the journalist would identify the lessons that environmental health professionals had learned so that those lessons could be passed along to colleagues everywhere. If any readers of this report ever confront an emergency response situation even remotely similar to the September 11 tragedy, then we hope their response will be more informed and effective thanks to what they have learned through this material.

*After issuing a request for proposals, the board selected Francesca Lyman, a freelance writer and MSNBC reporter, to research and compose the report. Ms. Lyman had covered the health aspects of the September 11 events in her *Your Environment* column, for which she won an award from the Society of Environmental Journalists in 2002.*

The following article actually constitutes the executive summary of the report. Readers will find the complete report on the NEHA Web site at www.neha.org.

Two years after September 11, 2001, when terrorist attacks leveled the World Trade Center, killing thousands of people, and hit the Pentagon, killing hundreds more, NEHA is issuing a report assessing the lessons for environmental health that can be learned from these disasters—widely regarded as the worst and largest international terrorist events in our nation's history.

The images of terror are still vivid to most of us, but not everyone has realized that the nation experienced a new kind of environmental health emergency as well. When the World Trade Center and sections of the Pentagon came crashing down on September 11, 2001, the rubble left for rescuers and cleanup crews was laced with asbestos, heavy metals, diesel fuel, PCBs, and dozens of other toxins. New York City was enveloped in a cloud of smoke, soot, and toxic ash.

The September 11 terrorist attacks shed dramatic light for the first time on the pivotal role of environmental health in terrorism preparedness.

"Since we're all on notice to expect some kind of event, NEHA wants to accumulate a base of knowledge to share with those in all areas of environmental health and public health so that they can be better equipped for the future," Nelson Fabian, NEHA's executive director, says.

The broad outlines of the incidents at the World Trade Center and Pentagon are fairly well known. But the inside story of how environmental health professionals worked behind the scenes to try to make a difference that day and in the months that followed is not well known. These events provide

important opportunities to understand how people responded under stress, as well as lasting lessons for emergency and environmental response.

Environmental health professionals are on the front lines in defending public safety in this age of terrorism, which is one of the main reasons NEHA took on the task of this report. For example, as the New York Sanitation Department's Environmental Police Unit told the *New York Times*, at one time the worst hazards they confronted were corrosive acids, asbestos, and contaminated medical needles. Today it's dirty bombs and more.

People working in the environmental health fields are today being joined by a host of other professionals—EMS and health first responders, public health nurses and doctors, epidemiologists, forensic pathologists, police and fire officials, and others.

In fact, the events of September 11, 2001, brought to the fore many issues that have long been simmering—the need for first responders to be more mindful of health and safety, the need for all emergency personnel to be better coordinated and able to communicate with one another, and, of course, the specter of responding to a biological or chemical terrorist attack.

What's the Purpose of This Report?

The mission of this document is to present the facts as they apply to environmental health professionals of all kinds, be they hazardous waste specialists or sanitarians, air quality technicians or public health department managers. Our considerations in this

report cover air and water quality, radiological and bioterrorism threats, hazardous substances and wastes, waste removal, carting and disposal, and public health interventions of all kinds, including food handling, sanitation, and vector control.

NEHA is interested in describing the important role of ensuring environmental health and safety—and hearing the stories of those unsung “heroes” whose stories haven’t come out, people at the frontlines who did their regular jobs under rather trying and extraordinary circumstances. These stories emerge in this report as well as healthy debate on issues such as the community’s right to know about environmental hazards in neighborhoods and the need of public officials to weigh the advantages and disadvantages of top-down control versus community response.

What are some of the major issues in addressing a catastrophic health disaster? What were the critical management lessons from the experience? How do public health and environmental health managers need to be better prepared in the future? What was left out last time? What went right and wrong at crucial decision-making junctures?

This document describes 1) what environmental professionals of all kinds did (and, to some extent, how they might have worked with first responders), as well as the pressures responses from the public and the community placed on them; and 2) what they might have done differently—what they learned from the experience.

This report is also designed to call forth a variety of new perspectives—including the following kinds of questions: How soon should the government be able to respond to protect public health and what kinds of prior coordination are needed among different agencies? What did the public expect of its public-interest agencies in such dire circumstances?

Since the events of September 11, many state and county health departments have started revamping their emergency response and evacuation plans to prepare for potential acts of terrorism, especially chemical and biological terrorism. And many experts see local public health departments as being central rather than peripheral to preparedness efforts.

Methodology and Recommendations

In this report, environment health professionals who were either directly involved in the rescue efforts of September 11 and

experienced these powerful events first-hand, or are experts in the field of environmental health, occupational health, or disaster response, suggest ways that the environmental health system can better be prepared to respond to large-scale disasters. The report is based on first-hand interviews, highlighting responses by officials responsible for environmental health, occupational health, and disaster response, as well as accounts in the press and public documents.

The report draws upon lessons learned from the terrorist attacks to equip environmental health professionals to better understand and anticipate the health and safety needs of communities who would respond to terrorist incidents in the future. NEHA wanted to document the stories, experiences, and knowledge of these professionals in the hopes of passing on their lessons and understanding the implications for future response.

September 11 crystallized the importance of environmental health... and signaled the rise of this discipline on a par with other emergency response professions.

The report’s suggestions from experts recommend

- increased preparedness on the part of the environmental health personnel and better coordination of environmental health considerations in terrorism preparedness planning;
- improved scientific understanding of environmental hazards and standard-setting to meet these needs, better environmental health monitoring systems and tools in place; and more environmental health training; and
- better communication of hazards to the public, to increase public awareness of environmental health, which can save lives and reduce the public health costs associated with large-scale disasters like the World Trade Center and Pentagon attacks.

Some Findings: Q & A

What Was the Role of Environmental Health?

In New York, that first day, the World Trade Center disaster would overwhelm the public agencies but not in ways that they traditionally do—putting demands on hospitals and medical workers. Sadly, too many hospital beds would not be needed.

A physician who left the site early said his expertise would be less in demand than knowledge about “the toxicology of building collapse.” Far more important, say officials, would be everything to do with environmental health—from the smoke and dust affecting air quality to the potential problems of rodents and rotting food in the neighborhoods affected by the buildings’ wreckage.

In the first 24 hours, local environmental health department professionals and others faced unprecedented challenges, including mountains of dust and debris containing mostly pulverized cement, fiberglass, glass, and building materials, but also as-yet-unknown and varying amounts of toxic metals, plastics and other compounds, burning plastics and fuels, and smoke and fumes from the building fires. Some of the same challenges, on a much smaller scale, emerged at the Pentagon.

The biggest vacuums proved to be

- getting help for the rescue workers and
- getting good information to the tens of thousands of people living and working around Ground Zero in the days and weeks after the disaster.

In many ways, September 11 crystallized the importance of environmental health and the various professionals engaged in this field, and signaled the rise of this discipline on a par with other emergency response professions.

Did the Responding Agencies, Federal, State, and Local, Have the Resources They Needed to Do Their Job Effectively?

Initially, the scale of events on September 11 overextended the abilities of health departments and even federal environmental managers. In New York City, agencies like the U.S. Environmental Protection Agency’s (U.S. EPA’s) Region II and the city department of health were forced to close because of their proximity to the disaster; the Office of Emergency Management was destroyed, and a new command center had to be created at a separate location. Officials struggled to get staff coverage in both New York and Arlington County, Virginia.



September 11

As the crisis developed, however, the agencies had access to virtually unlimited funding. In New York, President George Bush told city residents that no expense would be spared to make sure people were “safe in their homes.” Critics argue that more resources should have been spent to protect public health and that resources offered should not have been turned away. Local environmental health professionals say they wish more resources had been earmarked to come their way.

Was Environmental Health Integrated into the Incident Command System?

At the World Trade Center disaster, the city took the lead in the crisis, with the Fire Department initially in command. But many state and federal agencies stepped in to help coordinate. That was helpful, as New York City officials had no reason to be well versed in the chain of command operating for federal emergencies. There was confusion, however, about who took the lead in environmental health—a failure that continues to this day.

At the Pentagon, the incident command system and the system designed for “all hazard consequence management” worked superbly, say experts. That was partly because the operation was under a single command: the Arlington County Fire Department. Emergency teams worked well together in part because of pre-established relationships, adequate resources, and prior experience in emergencies; some of the first

responders were seasoned responders who had experience from the Oklahoma City bombing as well as from another prior tragedy, an airline crash at National Airport.

By contrast, New York’s response was one of huge “organizational complexity,” according to experts. One expert tracked a list of as many as 449 organizations responding to the emergency, including 159 from the public sector alone. Because the task of handling the response was so monumental, and because so many agencies were responding to the crisis in New York City, top managers chose to divvy up the tasks among city, state, and federal authorities. For example, rather than assigning a single federal authority, such as U.S. EPA or the Federal Emergency Management Administration, to oversee the entire environmental health effort as a whole, the agencies shared resources and information, as well as responsibility for collecting air and dust samples, testing those samples, and assessing health risks.

The challenge had so many facets that U.S. EPA took charge of monitoring and cleaning up outdoor spaces, with help from the city and state; it also took the lead in communicating risks with respect to outdoor air and dust, leaving the issues of indoor dust and cleanup to the city department of health, for example. But that left confusion as to which agency was in charge of what, and which agency the public should direct its questions to.

Was the Environmental Health of People Returning to Home and Work Protected on September 11?

Thanks to a strong public health infrastructure, and help from federal officials at the Centers for Disease Control and Prevention (CDC), officials were able to avert secondary public health disasters—outbreaks of foodborne diseases, or diseases spread by insects, rats, or bacteria. In New York, hundreds of restaurants that had suddenly closed were inspected and cleaned. Hastily erected food-handling stations were monitored in both cities. Federal officials helped launch a syndromic surveillance system for the first time, to track any unusual disease patterns.

However, people working and living around Ground Zero in New York weren’t adequately warned about the invisible, hidden dangers lurking in the dust and debris.

The recent revelations from U.S. EPA’s Office of the Inspector General (OIG) have focused a harsh spotlight on how health risks were assessed and communicated. OIG’s investigation found that the White House had influenced the agency to put a “reassuring” spin on its information to the public, cutting out mention of the few precautions contained in press releases that would have been helpful to vulnerable populations such as the elderly, children, and those already at risk.

The OIG report also reveals the systematic attempt by the government at the highest levels to downplay risks in order to reopen



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Photo credits: Top six photos: Paul Olivieri. Small inset photo: Library of Congress, Prints & Photographs Division; photograph by Don Hatalas.

Wall Street. While some observers had feared this was the case, the report for the first time documented that interference.

“Messages in the Dust” corroborates the difficulties faced by the many people responding to the disaster: the lack of coordination among agencies; the unclear lines of authority with respect to health hazards faced by residents and workers; the disorganized approach to worker safety; the failure to address the health hazards of interior spaces as people returned to their homes and offices, and other, unavoidable, problems like communications and electric breakdowns.

This report uncovers dozens of heroic efforts by individuals, but also some major policy failures: No agency enforced proper respiratory protection for workers; no agency took charge of the environmental health piece of the September 11 disaster; and no agency focused on indoor cleanup until U.S. EPA finally mounted a residential cleanup program in response to public protests and congressional hearings.

In the ugly event that we are to suffer another terrorist incident, how well would another city or town respond in conjunction with other government agencies?

Look no further than the history of the environmental health response at Ground Zero in New York, where, even two years later, the debate continues over the habitability of homes and offices in the Ground Zero vicinity. Today, some New Yorkers voice continued

concern about the potential toxicity of lingering dust in indoor areas of their apartments, and some offices, too, have failed to reopen because of public fears about the safety of their indoor environments. An article in New York’s *Newsday* newspaper reports: “Two years after the collapse of the World Trade Center, health officials still have no idea whether most of lower Manhattan’s commercial buildings have been properly cleaned.”

Today, U.S. EPA’s OIG is urging the agency to re-launch a new, systematic program to make sure apartment cleaning by the agency does reduce residents’ exposure to indoor pollutants. As in future terrorist events, U.S. EPA is tasked under a 1998 Presidential Decision Directive, according to the OIG, “with the leadership role in cleaning up buildings and other sites contaminated by chemical or biological agents as a result of terrorism.”

For more than a year, Congressman Jerrold Nadler (D-New York) and other advocates of a comprehensive cleanup of interior environments have charged that federal, state, and city agencies scandalously tried to evade their responsibilities and left citizens to their own devices where their health was concerned. To this day, Nadler told NEHA, U.S. EPA and other agencies have failed in their obligation to protect the public from the after-effects of an international act of terrorism. “This was a terrorist attack, and the federal government is

entrusted with the role of protecting the public’s health and safety, telling people to take proper precautions if they’re needed and doing what’s needed to clean up after an attack,” says Nadler. “As of now, they have still not fulfilled their mandate.”

While many now blame insufficient awareness of the risks and hazards on political factors like the rush to return to normalcy and to get the financial district running again, other factors were at work too. There was a lack of good sampling in the first days after September 11 because of factors beyond the control of environmental agencies, like power and communications breakdowns. Many agencies didn’t have contingency preparedness plans ready and were struggling with simultaneous terrorist worries because of the anthrax crisis that came on the heels of September 11.

A key problem was that the teams of people and the tools for environmental monitoring were not in place to respond to an event of the kind that happened. Shockingly, even though the high particulate count from the building collapses was higher than New York City had ever experienced in its history, the tragic event *violated no pollution standards for particulate matter*.

That’s because the air quality regulations were set up to measure particulate matter loadings over 24-hour periods, rather than intense, short-term bursts. Yet a high-particulate storm could produce—and likely did pro-



Photos: Earl Dotter

Ground Zero

duce—severe health impacts. Furthermore, air standards did not adequately account for other health concerns caused by very fine particulate matter arising from the fires. And environmental health researchers weren't used to assessing any of these kinds of risks.

Some critics blame the agencies for putting too much focus on the physical hazards of cleanup and not enough on environmental health. Even though the agencies continued to argue that the toxicants detected in the air did not exceed safety standards, they failed to note that the contaminants were so new and exotic that in many cases standards didn't exist for many of them. The standard that was applied to asbestos, one of a dozen hazardous substances detected at the site, was, as the Inspector General noted, a benchmark originally used to determine when asbestos-containing material was subject to demolition and renovation regulations—it was not even based on health considerations.

Others say that officials focused too much on asbestos to the exclusion of other potent pollutants and the synergistic effects of those substances when combined. Much more work needs to go into researching the human health effects of pollutants and their synergistic effects, as OIG's report concludes, so that experts can be better prepared to comment on hazards to the public.

In hindsight, critics say the environmental health risk assessment at Ground Zero ought to have been far more precautionary, given the lack of scientific certainty about the human health effects of exposure to unprecedented combinations of hazardous substances, including troubling levels of cancer-causing substances like benzene, polychlorinated biphenyls (PCBs) and asbestos.

At the other end of the hazard spectrum, some disaster experts said that the environmental impacts at Ground Zero reminded them of the kinds of environmental health crises that might occur in a natural disaster—a volcano or a tornado. Perhaps if this event had it been a natural disaster, many of the issues that remain controversial today might have been resolved more quickly.

Today, levels of public confidence are not high in New York City. A recent poll by *Newsday* found that two years after the tragedy, 68 percent of New Yorkers are still concerned that airborne pollutants from the collapse of the towers will cause long-term problems for those who work and live in downtown Manhattan.

Meanwhile, a recent poll of downtown residents shows that health ailments related to September 11 remain. According to poll takers Blum and Weprin, 30 percent of respondents who lived downtown before September 11 said someone in their household suffers from coughing, respiratory prob-

lems, or some other ailment they believe to have been caused by World Trade Center debris. As for new residents, 25 percent answered yes to this question.

The health toll for rescue workers is, of course, much worse. In New York City, the terrorist attacks have triggered a flood of legal claims by workers against the city, according to a report released by City Comptroller Bill Thompson in June 2003. Firefighter claims against the city increased more than 20-fold last year because of the World Trade Center disaster.

It's too soon to say if the World Trade Center attack will have long-term health effects on New York residents, but there are troubling signs. Pregnant women exposed to air pollution from the World Trade Center attacks, according to a preliminary study released in August 2003, apparently face double the risk of delivering babies up to a half-pound smaller than babies born to women not exposed.

Local physicians still report a steady stream of patients complaining of respiratory symptoms related to the terror attacks. Some worry about the long-term consequences of the pollution—with silent culprits like asbestos and other carcinogens released during the initial building collapse, fires that burned for several months, and residual contaminated dust lurking in corners and crevices, and re-suspended in the air.

How Well Did the Government Assess and Communicate Environmental Health Risks?

Agencies say the biggest lessons of September 11 were in the area of communicating risks to the public.

Federal agencies, either through sloppiness and poor coordination, or deliberate calculation, as U.S. EPA's Inspector General suggests, failed to warn the public of potent hazards. U.S. EPA came out way too early about the safety of the site, some scientists charge. And despite the many worker hazards, OSHA failed to issue a single citation to contractors or workers.

Although it was a chaotic time, some say that there was no scientific basis for city and federal government officials to state that New York's neighborhoods were safe to reinhabit within the first few weeks of the disaster.

Once tens of thousands of people had returned to their homes and offices in New York City after the terror attacks, who were they to go for health advice on cleaning up dust-covered walls and furnishings, or to seek medical or legal advice? Many complained that they were confused or given the run-around by agencies.

Do Emergency Planners Need to Be Educated About the Key Public Health Function That Environmental Health Professionals Provide?

Since there's likely to be some sort of environmental contamination in future attacks, local agencies need to be prepared to deal with the kinds of issues that surfaced in New York—indoor contamination and removal, and assessment of risks to vulnerable populations.

And, experts point out, all sorts of future environmental disasters, from earthquakes in urban areas to tornadoes, fires, and hurricanes, could include a complex building collapse.

Most agree that all these concerns have forever ratcheted up the relative importance of public health and environmental health in relation to other aspects of concern in any disaster, from real estate and property damage to medical preparedness. "There is more awareness now about what it takes to protect the public and how important the role of the environment is," says Alison Geyh, assistant professor of environmental health sciences at Johns Hopkins University; she is one of the key public health researchers who braved fumes and dust to investigate the hazards at Ground Zero.

That awareness has raised the profile of environmental health professionals of all stripes.

Do Key Decision Makers Need to Be More Aware of What Environmental Health Is and What Abilities It Brings to Addressing Key Health Issues in a Disaster?

The terror attacks in New York and Arlington, Virginia, shared certain challenges that made them different from other health emergencies or disasters.

Both events were much larger in scale than any experienced before, as well as more devastating in impact, with mass casualties, short-term and long-term health effects, and a greater range of hazards occurring all at once—worker hazards, respiratory hazards, smoke, and dust. The array of hazards was unprecedented—air, water, dust, debris, and waste removal. The pollutants presented unique challenges—*asbestos*, for example. Because the World Trade Center towers were built before *asbestos* was prohibited in 1980, the material could be found in parts of the building; yet U.S. EPA had never regulated it as an outdoor pollutant and therefore had no standard for it.

There were also traditional environmental health concerns and routine public health checks—*food handling*, sanitation, and so forth—that needed to be tended to while the crisis was managed. In addition, the crisis triggered secondary threats—like potential rat and vermin problems and infectious-disease outbreaks.

The authority for the Ground Zero site changed many times, and it was unclear which agency was in charge of which functions.

Furthermore, both attacks required a much bigger response than heretofore and more coordination among other agencies (some of which weren't used to communicating), as well as more complicated communication with the public.

Both incidents required coordination with emergency response officials at U.S. EPA and coordination with worker safety departments. But agencies with past experience collaborating in natural disasters or hazardous materials incidents had greater difficulty in this case. At the Pentagon, for example, U.S. EPA noted that local responders failed to recognize its crucial role in emergency response.

At the same time, public health professionals were working with more law enforcement and military people. Unlike other natural disasters in which environmental health professionals would have been called in, the World Trade Center and Pentagon disasters were considered crime scenes.

Have We Learned Anything from Two Years' Worth of Lessons?

Environmental professionals cite a litany of lessons.

1. *Call a hazard a hazard. And be ready to protect the public against all environmental risks.*

Public officials need to be open about risks and hazards to the public, and agencies should not try to downplay those hazards. "It's very clear that the government may have gone too far in reassuring people," says Kenneth Olden of the National Institute of Environmental Health Sciences (NIEHS). "People are still suffering. And there may well be long-term consequences to the public [from the hazards at the disaster site of the former World Trade Center.]"

Recommendation: The public may want to be reassured, but great care should be taken to make sure that the information they're given is accurate and useful. It is vital that press releases be written by those professionally competent to judge risks so that no errors are made.

2. *If it is a health emergency—as well as a disaster—treat it that way. Be clear about what kind of event it is.*

Critics say U.S. EPA could have done more to protect residents from the pollutants coming off the Ground Zero site, by warning them or making efforts to restrict them from hazards.

Air pollution expert Thomas Cahill, of the University of California at Davis, and Marjorie Clarke, hazardous waste expert at Lehman College, fault the agencies for not coming up with a way to keep unprotected populations away while the "pile" was burning like an uncontrolled incinerator.

If U.S. EPA has authority under the National Contingency Plan to control the release of hazardous substances, it should be ready to address complex building fires in the future.

The perimeters of environmental contamination should be defined. There should have been systematic testing of dust and debris in different gradients from the epicenter of Ground Zero, to know the level of hazard to the public, suggests Dr. Stephen Levin of Mt. Sinai Medical Center. "Instead, the city set an arbitrary line at Canal Street," says Levin. "But that is a political, not a medical or scientific boundary."

Senator Hillary Clinton (D-New York) suggested that setting health-based air quality standards should be part of the Homeland Security Act. Specifically, this was described as a "new emergency protocol for environmental health that identifies pollutants to be tested for in the aftermath of a disaster."

Recommendations: Data are critical in managing emergencies. Investments should be made in making sure that adequate environmental data and protocols are available.

3. *Create a clear chain of command to protect health and safety.*

The authority for the Ground Zero site changed many times, and it was unclear which agency was in charge of which functions. Occupational health protections suffered, and some environmental health questions fell through the cracks—such as the question of how to protect residents from hazardous indoor dust.

Critics have suggested that there ought to have been a lead agency for environmental health, to coordinate among the various other agencies. Had there been such an agency at Ground Zero, it could have made sure respiratory protection was emphasized from day one. "The way it was at Ground Zero, we couldn't throw workers off the site if they didn't comply," says U.S. EPA's Steve Touw.

"There ought to be solid interagency agreements worked out beforehand to ensure good coordination," says scientist Paul Lioy, a professor of environmental and community medicine at Rutgers University in New Jersey, "and perhaps under the Department of Homeland Security there can be much better pre-planning and coordination."

Recommendations: There should be effective pre-planning, coordination, and (most important) enforcement

mechanisms to ensure that standards are enforced.

4. *Open honest communication with the public.*

"I don't think we understood at the time the magnitude of the risk communication challenges we faced," says New York City Department of Health and Mental Hygiene's Kelly McKinney.

Critics say, however, that the public shouldn't be kept in the dark about real or potential environmental hazards. Public officials should not make reassuring statements before they have the information.

U.S. EPA came out way too early about the safety of the World Trade Center site, critics say.

...some environmental health questions fell through the cracks—such as the question of how to protect residents from hazardous indoor dust.

At the same time, federal agencies shouldn't withhold data, as some charge U.S. EPA did under the guise of "national security" in fighting terrorism. Nor should "terrorism" be used as an excuse to hold back information, as it has been in some instances.

Disaster experts also emphasize that officials should enlist the public's help. They stress that it is important to have the public trust so that the public can be depended upon to help in a crisis, by, for example, stopping cell phone use so as not to deter the transmission of emergency information.

Recommendation: Make data available as soon as possible, with a registry of samples.

5. *Develop better training and preparedness.*

Most fire departments are not familiar with respirators needed for hazardous events unless they've been trained. Some first responders don't fall into current categories of people who receive "environmental health" training and went into the WTC disaster without any sense of the consequences of being exposed; tow truck operators, electricians, telephone repair people, and other

professionals integral to urban infrastructure need to be considered.

In responding to the World Trade Center disaster, local hospitals were ready for any casualties and injured victims because they were prepared from the last terrorist attacks. In Arlington County, local emergency responders had experience from an earlier airport disaster. Local, state, and federal agencies in New York City, by contrast, were not prepared to coordinate their efforts because their disaster plans had never been tested before. And, strikingly, the Rand Corporation has found that few localities are prepared for chemical or biological terrorism.

Recommendation: Have a broader definition of first responder, says Mark Penn of the Arlington County Office of Emergency Management.

6. *Develop better health registries and health tracking. Localities should start developing health data right away, instead of simply relying on samples and monitors.*

New York's 9/11 Environmental Action group complained that the city waited two years to start its long-promised Health Registry in New York, months after physicians, researchers, and residents clamored for it.

While more than 50 infectious diseases are tracked in this country, the Pew Environmental Health Commission found almost no national monitoring of chronic diseases. ("For instance, more than half of the states have no ongoing tracking and monitoring of asthma. And less than half of the nation's population is covered by birth defects registries. Only nine states report tracking developmental disabilities such as mental retardation and cerebral palsy.")

Supporters of a Nationwide Health Tracking Network advocate involving a network of local, state, and federal public health agencies in tracking the trends of priority chronic diseases and relevant environmental factors in all 50 states and Washington, D.C., Puerto Rico, and U.S. territories. Doing so, they say, will help create an early warning system to monitor immediate health crises, such as heavy metal and pesticide poisonings, that can trigger action against hazards. A tracking network also would provide vital baseline data in case of any future terrorist incident.

Recommendation: Start the tracking system as soon as possible after a terrorist attack. The September 11 attacks have made the gap in our public health knowledge more dangerous than ever.

While Congress is considering how to help the public health system be better prepared in the face of unprecedented health risks—whether from the increasing concerns of disease clusters or unforeseen threats from chemical and biological terrorism—we must make sure investments are made in the right way and that they are part of a long-term commitment.

7. Actively promote better preparedness on evacuation plans.

Even though cities have evacuation plans, the plans are not enforced adequately. New York City didn't even contemplate any kind of evacuation plan, not having updated its disaster plan in more than 10 years.

Recommendation: Cities should update evacuation plans and make them enforceable; they should actively train fire marshals.

8. Improve the way buildings are designed and constructed.

Firefighters and their advocates have long been concerned about building materials because of their tendency to make for unusually toxic fires.

But is the construction industry revising how it builds—and how high it builds—especially in likely targets? To make for a safer post-9/11 built environment, construction planners need to investigate safer materials and designs that facilitate easier evacuation in emergencies.

Recommendation: From an environmental health perspective, designers also ought to look at construction materials for durability as well as elimination of toxic products and processes.

9. Make sure localities know how to manage volunteers as they converge upon the scene.

"As in other disasters, New York saw a tremendous influx of resources after the disaster. Some of these resources were needed, while others were a burden on the system," Tricia Wachtendorf notes in a presentation titled "A Changing Risk Environment: Lessons Learned from the 9/11 World Trade Center Disaster." Dodie Gill of Arlington County, Virginia, suggests finding constructive ways to accept people's donations of time and resources. When it comes to food, "Thank them, and once they've left, dispose of it quickly."

Recommendation: Learn to handle an overabundance of volunteers and donations.

10. Make way for better partnerships.

Robert Martin, former U.S. EPA ombuds-

man, faults the agency for failing to consult with the New York community on places hardest hit from a public health standpoint.

When it comes to research, the public and research community could benefit in the future if a more formal process were developed to guide the reactive and proactive steps that researchers should take in disaster situations. A national body such as NIEHS or the National Academy of Sciences could play a role in developing an action plan.

Recommendation: Consult with the community and empower its members to be involved. Set up a process to have a liaison research committee for the community. Develop a clearinghouse of research and scientific contacts and experts with past experience.

11. A new emergency protocol is needed for measuring potential pollutants.

There should be a new emergency protocol for environmental health identifying the pollutants to be measured in the aftermath of a disaster and standards for controlling them, suggests Senator Hillary Clinton.

Recommendation: Develop a set of environmental and health standards that can be applied to give decision makers a guide for addressing pollutants that might be of concern from an air or water quality standpoint, or that might be found in dust or particulates.

12. Give environmental health higher priority.

"At the 9/11 site, safety professionals were rotated in and out, but we didn't have the manpower," says Bruce Lippy of the National Union of Operating Engineers.

Professionals needed more staff and funding, argues CDC's environmental health expert Ron Burger. "There should be more than two or three environmental health professionals in a local health department of 20 or 30," he says. Provide an advisory to physicians so that they can be aware of illnesses that may arise out of environmental health consequences, suggests Dr. Stephen Levin of Mt. Sinai School of Medicine.

Recommendation: Provide more funding for environmental health, particularly with regard to training and equipment.

13. Be ready to improvise.

"You can't plan for every single thing; but when something happens is not the time to take a plan out," says CDC's Ron Burger. At both Ground Zero and the Pentagon, says disaster scholar Kathleen Tierney, improvisation was as critical as pre-planning in handling everything from unsolicited food dona-

tions to creating credentialing procedures that balanced effective access to the site against security.

Recommendation: "Plan effectively beforehand," urges Tierney, but also create an environment where you can "improvise solutions to unforeseen problems that will inevitably develop."

Conclusion

In many ways, September 11 crystallized the importance of environmental health and the various professionals engaged in this field and signaled the rise of this discipline on a par with other emergency response professions.

Still, environmental health encompasses professions that are difficult to explain because they are obscure—like industrial hygiene. "Nobody knows or understands what you do, and you seldom get to see the real results of your work," writes Mike Plagge, an industrial hygiene advisor for American Superconductor in Middleton, Wisconsin, in *The Synergist*, the publication of the American Industrial Hygiene Association. "It's not glamorous like being a firefighter or a doctor. How often does someone thank you for preventing an occupational disease?"

Yet that has changed since September 11.

"As painful as it is to look back to the events of September 11, it is imperative that we do so that we might be better prepared for any comparable act of terrorism or natural disaster in the future," said New York Congressman Major Owens at a congressional hearing held in April 2002 at Borough of Manhattan Community College. "The tragedy provides us with a portal to evaluate how well our public health regulatory framework worked to protect workers and members of the public from occupational and environmental hazards posed by the collapse of the World Trade Center." ❧

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